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Cell Growth & Reproduction

1. Before a cell enters mitosis, what happens to the genetic information in that cell?

- ☐ A. The information is halved.
 - ☐ B. The information is selectively mutated.
 - ☐ C. The information is completely changed.
 - ☐ D. The information is duplicated.
-

2.

Animal	# of Chromosomes in Body Cells
Ferret	40
Giraffe	62
Gorilla	48
African hedgehog	90
Kangaroo	12
Spotted skunk	64

A spotted skunk sex cell divides by meiosis. The daughter cells produced each have _____ chromosomes.

- ☐ A. 96
 - ☐ B. 32
 - ☐ C. 64
 - ☐ D. 16
-

3. When new cells are formed through the process of mitosis, the number of chromosomes in the new cells

- ☐ A. decreases every time the cell divides.
 - ☐ B. remains the same as in the parent cell.
 - ☐ C. is half of that of the parent cell.
 - ☐ D. increases every time the cell divides.
-

4. Which animal cell type undergoes meiosis?

- ☐ A. all cells
 - ☐ B. heart cells only
 - ☐ C. non-reproductive cells only
 - ☐ D. reproductive cells only
-

5. Which word correctly fills both blanks in the description below?

Meiosis is an early step in sexual reproduction. In the process of meiosis, pairs of _____s separate and segregate randomly during cell division to produce gametes containing one _____ of each pair.

- ☐ A. chromosome
- ☐ B. haploid

- ☐ C. centromere
 - ☐ D. diploid
-

6. How are the processes of mitosis and meiosis similar to each other?

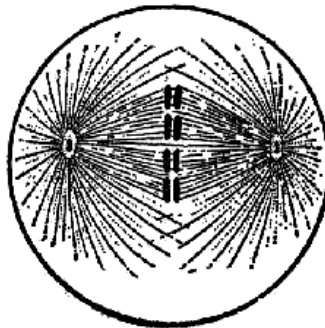
- ☐ A. Both processes begin with similar events, including chromosome replication.
 - ☐ B. Both processes involve only one division of cellular materials.
 - ☐ C. Both processes end with the same number of chromosomes present in each cell.
 - ☐ D. Both processes result in the same number of cells produced.
-

7. Which phase of mitosis is represented in the diagram below?



- ☐ A. telophase
 - ☐ B. metaphase
 - ☐ C. prophase
 - ☐ D. anaphase
-

8. The diagram below represents a stage of mitosis in which the chromosomes line up in the middle of the cell.



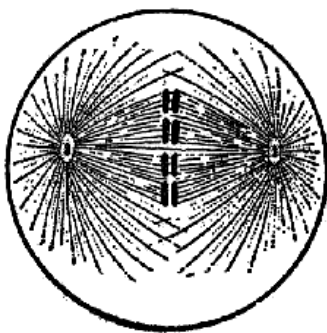
What is the name of this phase of mitosis?

- ☐ A. telophase
 - ☐ B. metaphase
 - ☐ C. prophase
 - ☐ D. anaphase
-

9. During the interphase stage of the cell cycle,

- ☐ A. the cell divides into two identical daughter cells.
 - ☐ B. the cell divides into two unique daughter cells.
 - ☐ C. the cell's chromosomes are duplicated.
 - ☐ D. the cell's chromosomes condense into rod-like structures.
-

10. The diagram below represents a stage of mitosis in which the chromosomes line up in the middle of the cell.



What is the name of this phase of mitosis?

- ☐ A. anaphase
 - ☐ B. metaphase
 - ☐ C. prophase
 - ☐ D. telophase
-

11. Mitosis and meiosis are methods of cell division.

Which of the following is true of these two methods?

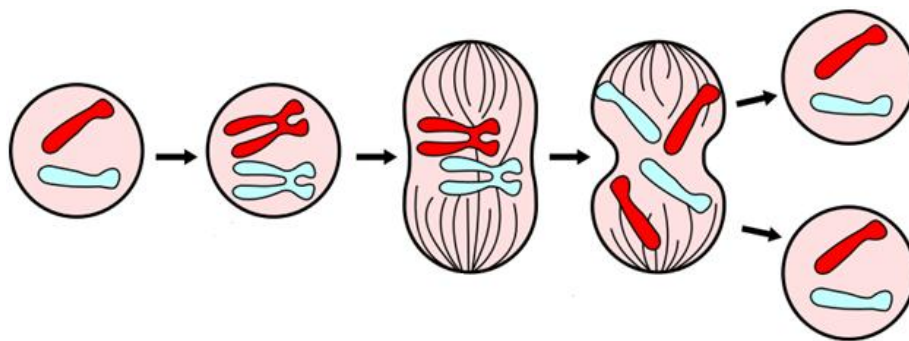
- ☐ A. Meiosis involves only one division, while mitosis involves two divisions.
 - ☐ B. Mitosis involves only one division, while meiosis involves two divisions.
 - ☐ C. Mitosis involves two or more divisions, while meiosis involves exactly two divisions.
 - ☐ D. Meiosis involves two or more divisions, while mitosis involves exactly two divisions.
-

12. Which phase of mitosis is represented in the diagram below?



- ☐ A. telophase
 - ☐ B. anaphase
 - ☐ C. prophase
 - ☐ D. metaphase
-

13. What is the name of the process that appears in the diagram below?



- ☐ A. differentiation
- ☐ B. mitosis
- ☐ C. fertilization
- ☐ D. meiosis

14. In which stage of the cell cycle does DNA replication occur?

- ☐ A. telophase
- ☐ B. metaphase
- ☐ C. interphase
- ☐ D. anaphase

15. Which of the following occurs during the interphase stage of the cell cycle?

- I. DNA is replicated.
- II. The cell divides.
- III. The cell grows in size.

- ☐ A. I and III only
- ☐ B. I, II, and III
- ☐ C. II only
- ☐ D. I and II only

16. During mitosis, one parent cell forms _____ daughter cells that are _____ the parent cell.

- ☐ A. four; different from
- ☐ B. two; different from
- ☐ C. two; identical to
- ☐ D. four; identical to

17. Which of the following cells are produced through meiosis?

- ☐ A. sex cells
- ☐ B. stem cells
- ☐ C. somatic cells
- ☐ D. all of these

18. Cellular reproduction in multicellular organisms occurs through the process of mitosis. What is the purpose of mitosis?

- ☐ A. to replace old chromosomes
 - ☐ B. to form gametes (e.g. sperm and ova)
 - ☐ C. to form new somatic cells
 - ☐ D. to replace old cells such as red blood cells
-

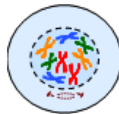
19. Daughter cells produced when cells undergo mitosis are genetically _____, and daughter cells produced when cells undergo meiosis are genetically _____.

- ☐ A. identical, diverse
 - ☐ B. flawed, perfect
 - ☐ C. perfect, flawed
 - ☐ D. diverse, identical
-

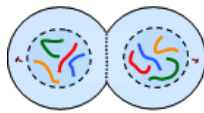
20. Through the process of meiosis, sex cells are produced that are

- ☐ A. identical with a half set of genetic information.
 - ☐ B. unique with a half set of genetic information.
 - ☐ C. unique with a full set of genetic information.
 - ☐ D. identical with a full set of genetic information.
-

21. The picture below shows a cell in prophase I of meiosis.



Below is another stage from the same cell.



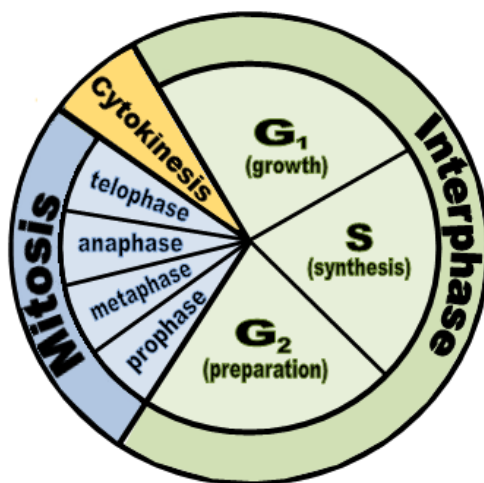
Which stage of meiosis is shown in the above picture?

- ☐ A. telophase II
 - ☐ B. telophase I
 - ☐ C. prophase II
 - ☐ D. metaphase I
-

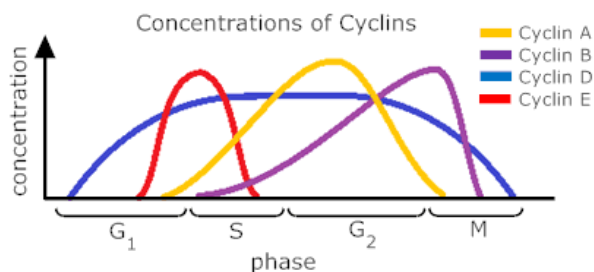
22. By the end of mitosis, _____ cells are produced, whereas by the end of meiosis, _____ cells are produced.

- ☐ A. two; four
 - ☐ B. three; one
 - ☐ C. one; three
 - ☐ D. four; two
-

23. Cells experience distinct cycles of activities, such as growth and division. These activities are summarized in the image below.



Beginning in the G_1 phase, proteins called cyclins begin to accumulate in the cell. Cyclins combine with certain molecules to form cyclin-dependent kinase complexes (Cdks), which activate and deactivate other cellular proteins.

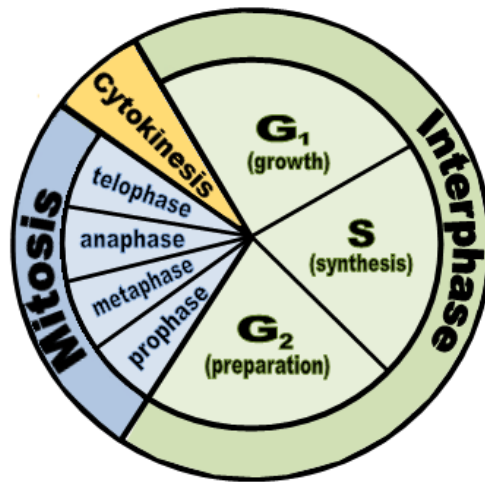


For example, cyclin B forms a Cdkc that controls the M stage of the cell cycle. This Cdkc turns on the proteins that are involved in mitosis, turns off the proteins that prevent mitosis, and even activates an enzyme complex that breaks down cyclin B. The loss of cyclin B signals the end of the M portion of the cycle. Notice that the concentrations of cyclin B peak during the mitosis stage.

Based on the above graph, which cyclin forms the primary Cdkc that controls the G_2 stage?

- ☐ A. Cyclin E
- ☐ B. Cyclin A
- ☐ C. Cyclin B
- ☐ D. Cyclin D

24. The cell cycle involves the growth, replication, and division of a eukaryotic cell.



Mitosis most directly plays a role in

- ☐ A. the metabolic processes of a cell.
- ☐ B. the division of a cell's nucleus.
- ☐ C. the growth of a cell after cell division.
- ☐ D. the transport of nutrients within a cell.

25. The cytoplasm and two nuclei that are formed during mitosis are separated into two identical daughter cells during _____.

- ☐ A. prophase
- ☐ B. meiosis
- ☐ C. interphase
- ☐ D. cytokinesis

26. Which phase of mitosis is represented in the diagram below?



- ☐ A. anaphase
- ☐ B. prophase
- ☐ C. metaphase
- ☐ D. telophase

27. Cytokinesis is a process that occurs during the cell cycle. During cytokinesis,

- ☐ A. the cell grows and performs normal life processes.

- ☐ B. the cytoplasm is divided to form two separate cells.
 - ☐ C. the chromosomes of the cell are duplicated.
 - ☐ D. the nuclear material of the cell is divided.
-

28. During the cell cycle,

- ☐ A. DNA is replicated once before mitosis and again before cytokinesis.
 - ☐ B. DNA is replicated before mitosis begins.
 - ☐ C. DNA is replicated during mitosis.
 - ☐ D. DNA is replicated directly after the completion of mitosis.
-

29. The cow has 60 chromosomes in its body cells. When the cow's body cells divide by mitosis, how many chromosomes will each daughter cell have?

- ☐ A. 120
 - ☐ B. 30
 - ☐ C. 180
 - ☐ D. 60
-

30. Cellular division involves the redistribution of the nuclear material, or DNA, as well as the cytoplasm and organelles. During which of the following processes is the cytoplasm and organelles divided?

- I. cytokinesis
 - II. meiosis
 - III. mitosis
-
- ☐ A. I only
 - ☐ B. I, II, and III
 - ☐ C. III only
 - ☐ D. II only
-

Answers

- 1. D
- 2. B
- 3. B
- 4. D
- 5. A
- 6. A
- 7. D
- 8. B
- 9. C
- 10. B
- 11. B
- 12. B
- 13. B
- 14. C
- 15. A
- 16. C

- 17. A
- 18. C
- 19. A
- 20. B
- 21. A
- 22. A
- 23. B
- 24. B
- 25. D
- 26. A
- 27. B
- 28. B
- 29. D
- 30. A

Explanations

1. Before a cell enters mitosis, the genetic information in that cell is **duplicated**.

This duplication occurs so that each of the two new cells receives all the necessary information to carry out its functions.

2. Daughter cells produced by meiotic division have half the number of chromosomes as the parent cell.

Therefore, cells produced by meiotic division in the spotted skunk would have **32** chromosomes each.

3. New cells can be formed through either mitosis or meiosis. Mitotic division is the normal process that body cells use to grow new tissue or repair existing tissue. In this type of cell division, **the number of chromosomes remains the same as in the parent cell**.

Meiotic division only takes place to produce gametes or spores. In meiotic division, new cells contain half of the number of chromosomes as the parent cell. If the gamete cell (egg or sperm) is able to unite with the opposite type of gamete cell (egg or sperm), the chromosomes will combine to form the full number of chromosome pairs, and normal mitotic cell division will begin.

4. Meiosis is the process that **reproductive cells** undergo to reduce the number of chromosomes by half in order to produce a gamete, or sex cell.

5. Meiosis is an early step in sexual reproduction. In the process of meiosis, pairs of **chromosomes** separate and segregate randomly during cell division to produce gametes containing one **chromosome** of each pair.

6. The processes of mitosis and meiosis both involve division of cellular materials, but are very different from each other. However, **both processes begin with similar events, including chromosome replication**.

DNA must be accurately replicated before it can be passed on.

7. The diagram represents **anaphase**.

Anaphase is the stage of mitosis in which the chromosomes separate. This phase is preceded by prophase and metaphase and followed by telophase.

8. There are four phases of mitosis.

During *prophase*, the cell's chromatin condenses into chromosomes, and sister chromatids pair up. During *metaphase*, the pairs of sister chromatids line up in the middle of the cell. Then, during *anaphase*, the sister chromatids are pulled apart from each other. Finally, during *telophase*, the chromosomes are grouped into two new nuclei.

This question shows a diagram of **metaphase**.

9. A cell spends the majority of its time in the interphase stage of the cell cycle. During this stage, the cell grows and **the cell's chromosomes are duplicated** in preparation for cell division. Cell division does not occur during this stage.

10. There are four phases of mitosis.

During *prophase*, the cell's chromatin condenses into chromosomes, and sister chromatids pair up. During

metaphase, the pairs of sister chromatids line up in the middle of the cell. Then, during *anaphase*, the sister chromatids are pulled apart from each other. Finally, during *telophase*, the chromosomes are grouped into two new nuclei.

This question shows a diagram of **metaphase**.

11. Although mitosis and meiosis are both methods of cellular division, **mitosis involves only one division, while meiosis involves two divisions**. After mitosis there are two cells, each the same as the original cell. After meiosis there are four cells, each with half the number of chromosomes of the original cell.

12. The diagram represents **anaphase**.

Anaphase is the stage of mitosis in which the chromosomes separate. This phase is preceded by prophase and metaphase and followed by telophase.

13. The process that appears in the diagram is **mitosis**.

Prior to this process, cells replicate their DNA during *interphase*. Then, the DNA molecules shorten and condense to form chromosomes during *prophase*. Next, the "twin chromosomes" come together and line up on fibers in the cell during *metaphase*. The twins are then pulled apart during *anaphase*, and the cell divides during *telophase*. Following telophase, the cytoplasm divides during *cytokinesis*.

The end result of mitosis is the production of two daughter cells, each containing chromosomes identical in number and composition to the parent cell.

14. DNA replication occurs during **interphase**, the phase of cell growth in between episodes of mitosis.

15. A cell spends the majority of its time in the interphase stage of the cell cycle. During this stage, the cell grows and replicates its DNA. Cell division does not occur during this stage. Therefore, **only I and III** are correct.

16. During mitosis, one parent cell forms **two** daughter cells that are **identical to** the parent cell. That is, the daughter cells have the exact number of chromosomes that the parent cell has, and the chromosomes are identical in composition to those of the parent cells.

17. Meiosis is the form of cell division by which unique **sex cells**, or gametes, are produced. These sex cells only contain a half set of genetic information. During fertilization, two sex cells (a sperm cell and an egg cell) combine to produce a unique offspring through sexual reproduction.

18. Cellular reproduction in multicellular organisms occurs through the process of mitosis. The purpose of mitosis is **to form new somatic cells**. Somatic cells are those cells that form the body of an organism.

Germ cells (e.g. sperm and ova) are not somatic cells and are formed through the process of meiosis, not mitosis. Red blood cells also do not reproduce through mitosis because they do not have nuclei. Instead, red blood cells are produced by stem cells in bone marrow through a process called erythropoiesis.

19. During the process of mitosis, cells divide to form two daughter cells that are **identical** to the parent cell and to each other.

In contrast, cell division by meiosis produces four daughter cells that are genetically **diverse** because they contain various random combinations of pieces from the parent cell's homologous chromosome pairs.

20. Meiosis is the form of cell division by which unique sex cells, or gametes, are produced. These sex cells are **unique and contain a half set of genetic information**. During fertilization, two sex cells (a sperm cell and an egg cell) combine to produce a unique offspring through sexual reproduction.

21. The cell stage shown is **telophase II**.

During meiosis, the stages of cell division - prophase, metaphase, anaphase, and telophase - are performed twice, unlike mitosis, which only undergoes each stage once.

In the first set of stages - meiosis I, DNA replication occurs followed by a pairing of homologous chromosomes. Then, the duplicated homologous chromosomes line up on the spindle before being pulled apart into two separate cells.

In the second set of stages - meiosis II, each individual chromosome again lines up on the spindle before the chromatids are pulled apart into separate cells.

22. By the end of mitosis, **two** cells are produced, whereas by the end of meiosis, **four** cells are produced.

Mitosis occurs in body cells and involves the duplication of the DNA, followed by the division of the cell to produce two cells with the same genetic material.

Meiosis occurs in gametes and involves the duplication of DNA, followed by the division of the cell to create four cells, each of which may contain slightly different genetic information.

23. The concentrations of **cyclin A** peak during the G_2 stage, suggesting that the start of this stage is triggered by high concentrations of the Cdkcs it forms. Similarly, cyclin A vanishes around the end of the G_2 stage. These two facts together indicate that the G_2 cycle is controlled by Cdkcs formed with cyclin A.

Similarly, cyclin E controls the transition from G_1 to S.

These examples show how complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities.

24. The cell cycle involves the growth, replication, and division of a eukaryotic cell.

During interphase, a cell's chromosomes are duplicated. After interphase, this cell undergoes mitosis. During mitosis, the nucleus of the cell divides into two daughter nuclei that each contain the same number of chromosomes as the parent nucleus. Finally, the two nuclei that are formed during mitosis are separated into two identical daughter cells during cytokinesis.

Mitosis most directly plays a role in **the division of a cell's nucleus**.

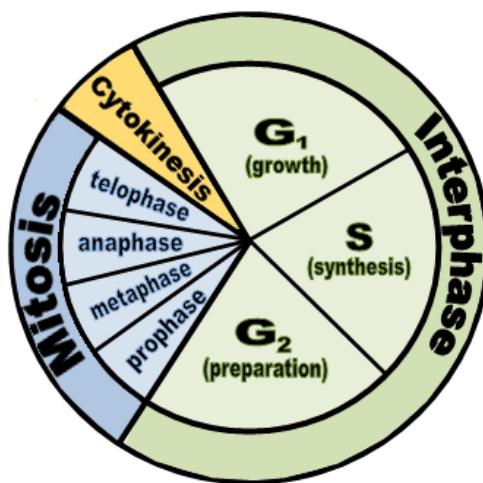
25. The cytoplasm, including organelles, and two nuclei that are formed during mitosis are separated into two identical daughter cells during **cytokinesis**. Both mitosis and cytokinesis are part of the M phase of the cell cycle, whose end result is two cells that are genetically identical to the parent cell.

26. The diagram represents **anaphase**.

Anaphase is the stage of mitosis in which the chromosomes separate. This phase is preceded by prophase and metaphase and followed by telophase.

27. The **cytoplasm**, including organelles, and two nuclei that are formed during mitosis **are separated into two identical daughter cells** during cytokinesis. Both mitosis and cytokinesis are part of the M phase of the cell cycle, whose end result is two cells that are genetically identical to the parent cell.

28. During the cell cycle, **DNA is replicated before mitosis begins** in what is known as the S phase or synthesis phase.



29. Body cells undergo a type of division called mitosis. During mitosis, the daughter cells produced are identical to the parent cell. So, daughter cells resulting from mitosis in a cow will have **60** chromosomes.

30. The nuclear material of a cell is divided during the processes of **mitosis** and **meiosis**.

The cytoplasm and the organelles of a cell are divided during the process of **cytokinesis**.